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# Evaluation of Storage Effects on Commercial, Biodegradable, Synthetic or Biosourced Hydraulic Fluid

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# Project Overview

- In 2001-2002, testing was performed to determine if commercially available, biodegradable, bio-based hydraulic fluid could meet or exceed the performance requirements in military combat/tactical hydraulic fluid specifications:
  - MIL-PRF 46170
  - MIL-PRF 6083



# MIL-PRF-46170

- Synthetic Hydrocarbon-based fluid (PAO)
- Rust Inhibited
- Fire resistant
- High flash point
- Class II biodegradable
- Poor low temperature properties



# Project Overview

- In 2005, FLTT evaluated the same bio-based, biodegradable hydraulic fluid to determine the effects of long-term storage
  - 23 samples
  - 3 years in storage



# Tests Conducted

- Flash Point ASTM D 92
- Fire Point ASTM D 92
- Galvanic Corrosion ASTM D 6547
- Kinematic Viscosity ASTM D 445
- Low Temperature Stability FTM 3458.1
- Lubricity (4-Ball) ASTM D 4172
- Pour Point ASTM D 97
- Total Acid Number ASTM D 664
- Water Content ASTM D 6304





# General Findings

## No Significant Property Changes

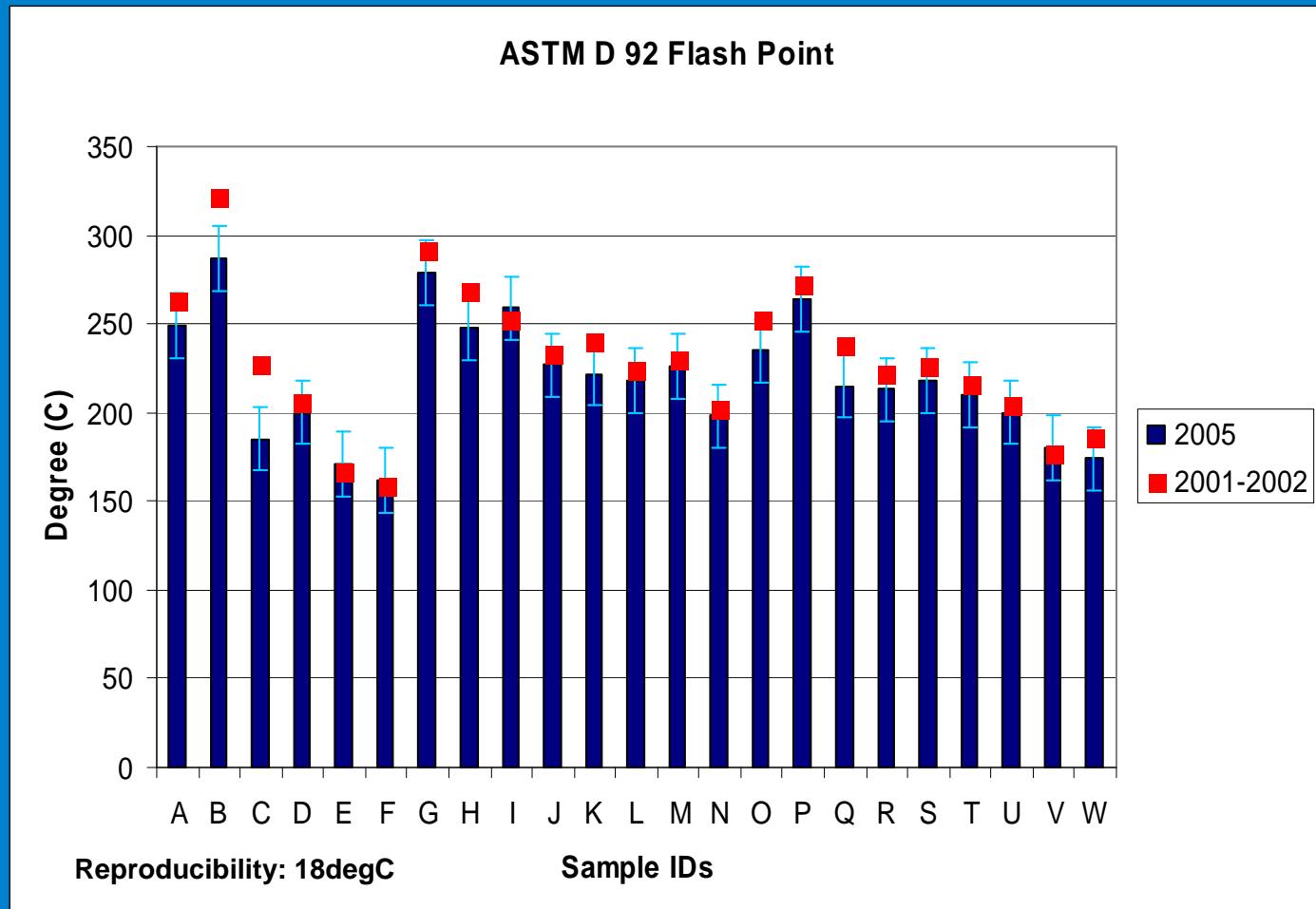
- Fire Point
- Galvanic Corrosion
- Kinematic Viscosity
- Low Temperature Stability
- Lubricity (4-Ball)

## Observed Property Changes

- Flash Point
- TAN
- Water Content

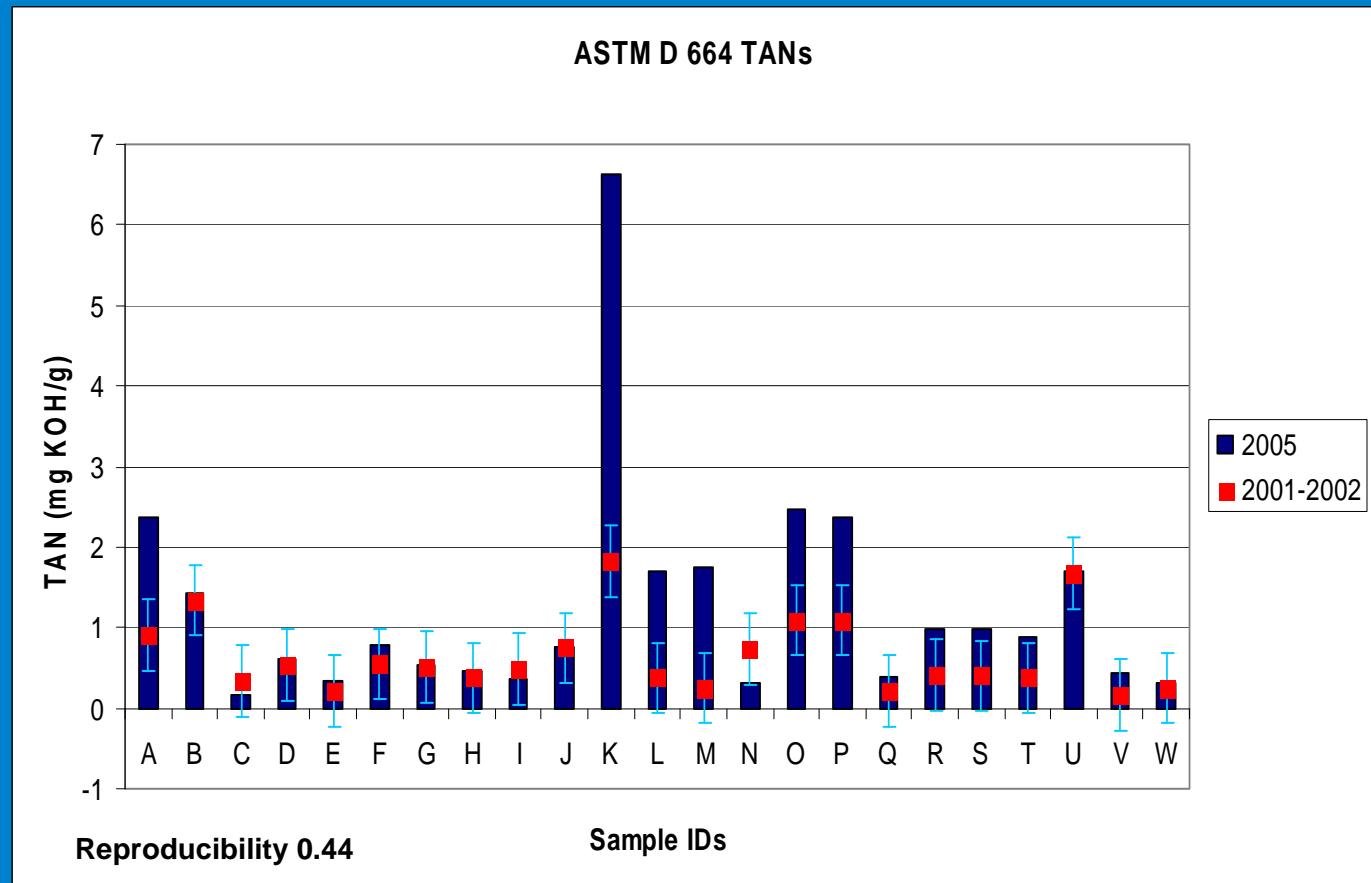
# ASTM D 92 Flash Point

4%-6% overall  
decrease in  
flash points



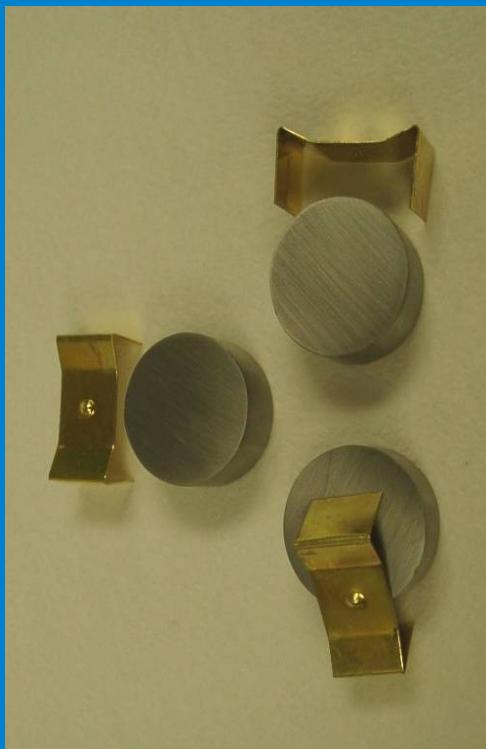
# ASTM D 664 Total Acid Number (TAN)

39%-40%  
increase  
in TAN





# ASTM D 6547 Galvanic Corrosion



- Two dissimilar metals
  - Alloy Steel Disks
  - Brass Clips
- Electrolyte
  - Bio-based Hydraulic Fluid

Hydraulic Fluid Handbook, Totten, Ch. 12-Failure Analysis



# Conclusion

- Bio-based hydraulic fluids are not suitable for long-term storage
- Products are not suitable for use in military combat/tactical equipment